

BIOLOGICAL EVALUATION

Douglas-Fir Tussock Moth
Cibola, Lincoln & Tonto National Forests

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By

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INTRODUCTION

The first Douglas-fir tussock moth infestation in the Southwest was discovered on Pinal Mountain, Tonto National Forest in Arizona in 1957. The following year (1958) three new infestations were recorded; one in Arizona and two in New Mexico. In 1959 an aerial control operation carried out by the Forest Service, applied 1 lb. of DDT in one gallon of fuel oil per acre to all infested areas. The following acres were treated: Pinal Mountain 4000, Baker Mountain 5,700, Tonto National Forest; Capitan Mountain 1800, Lincoln National Forest; and Sandia Mountain 17,900, Cibola National Forest. A very high kill was obtained in all areas except on the rough terrain of the west slope of the Sandia Mountain. Loss of white fir, its principal host, was moderate to heavy in the Pinal, Capitan and Sandia areas prior to the control operation.

A biological evaluation of the Sandia and Capitan infestations was made by D. A. Pierce and the writer during the week of November 23, 1959. The evaluation of Pinal and Baker infestations was made during the week of April 18, 1960 by J. F. Chansler and the writer.

*-resprayed
1186 on Tonto
not included
9656
1186
10,842*

TECHNICAL DATA

Causal Agent -- Douglas-fir tussock moth -(Hemerocampa pseudotsugata,
McD.).

Host Trees Attacked -- White fir, Abies concolor (Gord. & Glend.) Hoopes,
and Douglas-fir, Pseudotsuga menziesii var. glauca
(Beissn.) Franco. Preferred host is white fir.

Type of Damage -- Feeds on current and old needles and completely strips
trees in one year in areas having high caterpillar
populations. Tree-killing usually occurs after the
second year of complete defoliation. Initial damage
occurs in groups, ranging from one to fifty acres,
later spreading to the entire host type. Population
increase potential is extremely high and of an explosive
nature. The Sandia outbreak, for example, spread from
about 500 acres in 1958 to 20,000 acres in 1959.

Environmental Factors -- None are known at the present.

Location and Extent of Outbreaks -- (See attached maps)

Sandia Mountain, Cibola National Forest -- The infestation covered
the entire white fir type, about 20,000 acres, prior to the 1959 control
operation, however it is now limited to steep rocky, west slope of the
mountain where less than 6000 acres are infested. Tree mortality in
the area is moderate to heavy and occurs in large pockets.

Capitan Mountain, Lincoln National Forest -- Original outbreak covered 1800 acres and white fir mortality was heavy. Some moth activity still apparent around sprayed area.

Pinal and Baker Mountains, Tonto National Forest -- The 4000 acre Pinal and the 5,700 acre Baker infestations were successfully controlled by chemical means in 1959. An inspection of the areas failed to reveal 1959 egg masses. Tree mortality heavy on Pinal, but light on Baker.

EVALUATION OF THE POPULATION

Sampling Procedure.

Assessing the status of a Douglas-fir tussock moth infestation is logically directed to the egg stage. The egg masses, which are easily detected, are deposited in late summer and do not hatch until late spring of the following year. The method employed is based on limited knowledge of the behavior of the insect obtained during the recent outbreak and techniques used for sampling similar defoliating insects.

Index for the trend of tussock moth population was determined from biological data compared on a plot basis. Each plot consisted of 5 trees with 2 30-inch twigs taken from mid-crown of each tree. White fir was sampled in all plots, except in Juan Tabo Plot 2, where the samples were obtained from Douglas-fir. Plots were established in areas having egg masses or showing 25 percent or more defoliation. The number of new and old egg masses and cocoons were counted for each sample. An aluminum extension pole pruner was used to obtain the samples. Two plots were established in all centers of infestation.

Findings.

The separation of current from old egg masses posed no problem since new egg masses are easily detected and do not hatch until late spring. Separation of new and old cocoons was so difficult and so inaccurate that a breakdown by age was not done. Numerical comparison of the egg masses and cocoons collected from the samples is tabulated in Table 1.

Egg masses were placed in rearing and the number of emerged larvae and parasites recorded. A count was then made of the number of eggs per mass of undamaged egg masses. Some egg masses showed signs of being chewed by predators and were not counted. Percentage of unhatched eggs was based on the difference between the number of emerged larvae and parasites from the total number of eggs. Results are listed in Table 2.

Cocoons collected in the late November 1959 sampling were examined in the laboratory for percent of successful adult emergence. Pupae that failed to develop were placed in rearing. Results are listed in Table 3. From the rearing information it is apparent that except for the Canon Media Plot the majority of the cocoons were deposited in 1959.

Table 1.--Comparison of new and old Douglas-fir tussock moth egg masses and population trends at 7 localities in Arizona and New Mexico - 1959.

Area	Locality	Plot	Number of egg masses		Ratio 1959 to old	1959 level before Treatment	Population trend after Treatment
			1959	old			
Cibola N.F. Sandia Mt. (West slope)	Canon del Agua	1	20	2	10.0:1	High	Up
		2	45	7	6.4:1	High	Up
	Juan Tabo Canyon	1	35	1	35.0:1	Very High	Up
		2	42	3	14.0:1	Very High	Up
	Bear Canyon	1	5	3	1.7:1	Med.	?
		2	7	2	3.5:1	Med.	Up
Sandia Mt. (East slope)	Canyon Media	1	0	5	0.0:1	High	Down
		2	2	5	0.4:1	High	Down
Lincoln N.F. Capitan Mt.	Hinchley Canyon	1	1	0	1.0:0	Light	?
		2	1	1	1.0:1	Light	?
Tonto N.F.							
Pinal Mt. 1/	Pinal Mt.	---	---	---	---	High	Down
Baker Mt. 1/	Baker Mt.	---	---	---	---	Mod.	Down

1/ Ground inspection failed to reveal 1959 egg masses.

Table 2.--Results of rearing Douglas-fir tussock moth eggs collected from Sandia and Capitan Mountains, New Mexico - 1959.

Area and Locality	Plot	Number of egg masses	Number of larvae	Number of parasites	Unhatched eggs	Total eggs	Ave. egg per mass	Percent larvae	Percent parasites	Percent unhatched eggs
Cibola N.F. Sandia Mt.										
Canon del Agua	1	15	945	641	1189	2775	185	34.0	23.1	42.9
	2	39	3003	1385	2271	6659	171	45.1	20.8	34.1
Juan Tabo Canyon	1	31	1709	1436	1675	4820	155	35.4	29.8	34.8
	2	34	2364	1651	2406	6421	189	36.8	25.7	37.5
Bear Canyon	1	5	357	367	511	1235	247	29.0	29.7	41.3
	2	6	396	321	676	1393	232	28.4	23.0	48.6
Lincoln N.F. Capitan Mt.										
Hinchley Canyon	1	1	9	27	77	113	113	08.0	23.9	68.1
	2	1	10	23	72	105	105	09.5	21.9	68.6

Table 3.--Rearing record of Douglas-fir tussock moth pupae showing parasitism and percent of adult emergence by cocoon examination. Sandia and Capitan Mountains, New Mexico-1959.

Area and Locality	Plot	Total Cocoons	Emerged parasites	Percent adult emergence
Cibola N.F.				
Sandia Mt.				
	1	88	17	50.0
Canon del Agua	2	231	38	63.6
	1	160	23	50.0
Juan Tabo Canyon	2	313	72	62.3
	1	45	19	57.8
Bear Canyon	2	54	32	68.5
	1	53	0	64.1
Canyon Media	2	92	5	57.6
Lincoln N.F.				
Capitan Mt.				
	1	0	0	0.0
Hinchley Canyon	2	15	0	0.0

DISCUSSION

Sandia Mountain, East Slope -- Overall, the 1959 control operation was successful. Some moth activity was found around Canyon Media and was sampled. Ratio of new to old egg masses was less than 1 to 1. In addition, 1959 cocoons were low in number. This pocket of infestation is expected to subside in 1960. No other active centers were found in the area.

Sandia Mountain, West Slope -- The large spray planed used on the 1959 control project could not adequately treat the west slope host type which occupies steep, rocky ledges and drainages. In such stands the infestation continues and about 6000 acres are infested. Sampling plots were established in Canyon del Agua, Juan Tabo and Bear Canyons.

The evaluation shows that a heavy population of tussock moth still exists in the area. In Juan Tabo Canyon, for example, a ratio of 35 new to 1 old egg mass was found, indicating an alarming population increase. The average increase of new to old egg masses was 8.6 to 1. General level of the population was determined by the number of new egg masses per 10 30-inch twigs (plot). Using preliminary data from other areas as a guide, plots which tallied 30 to 40 egg masses usually suffered heavy defoliation. Except for Bear Canyon, the number of egg masses per plot can be considered as representing a potentially high population level.

Comparative figures are not available for analyzing the results of the number of eggs per mass, percent hatch and egg parasitism. Based on 130 egg masses the average number of eggs per mass was 179. Percent of larval and parasite hatch was 37.6 and 24.9, respectively.

A very high mortality among trees completely defoliated for the second consecutive year is expected. Tree-killing in relatively large blocks is forecast for 1960, unless chemical control is applied.

Capitan Mountain -- Scattered egg masses were found in the control area. Two plots were established in areas where new egg masses were most abundant. Both were outside the control boundary. Only one new egg mass per plot was found. Results of the evaluation are listed in Tables 1-3.

Tree sampling data from the area must be treated with some caution. Egg masses, in large numbers, were found underneath rocks as well as on the trees. Therefore, during general inspection of the area about 100 rocks in the vicinity of the plot were overturned and examined for egg masses. Further study on the egg laying habits of the Douglas-fir tussock moth under various stand or site conditions is needed.

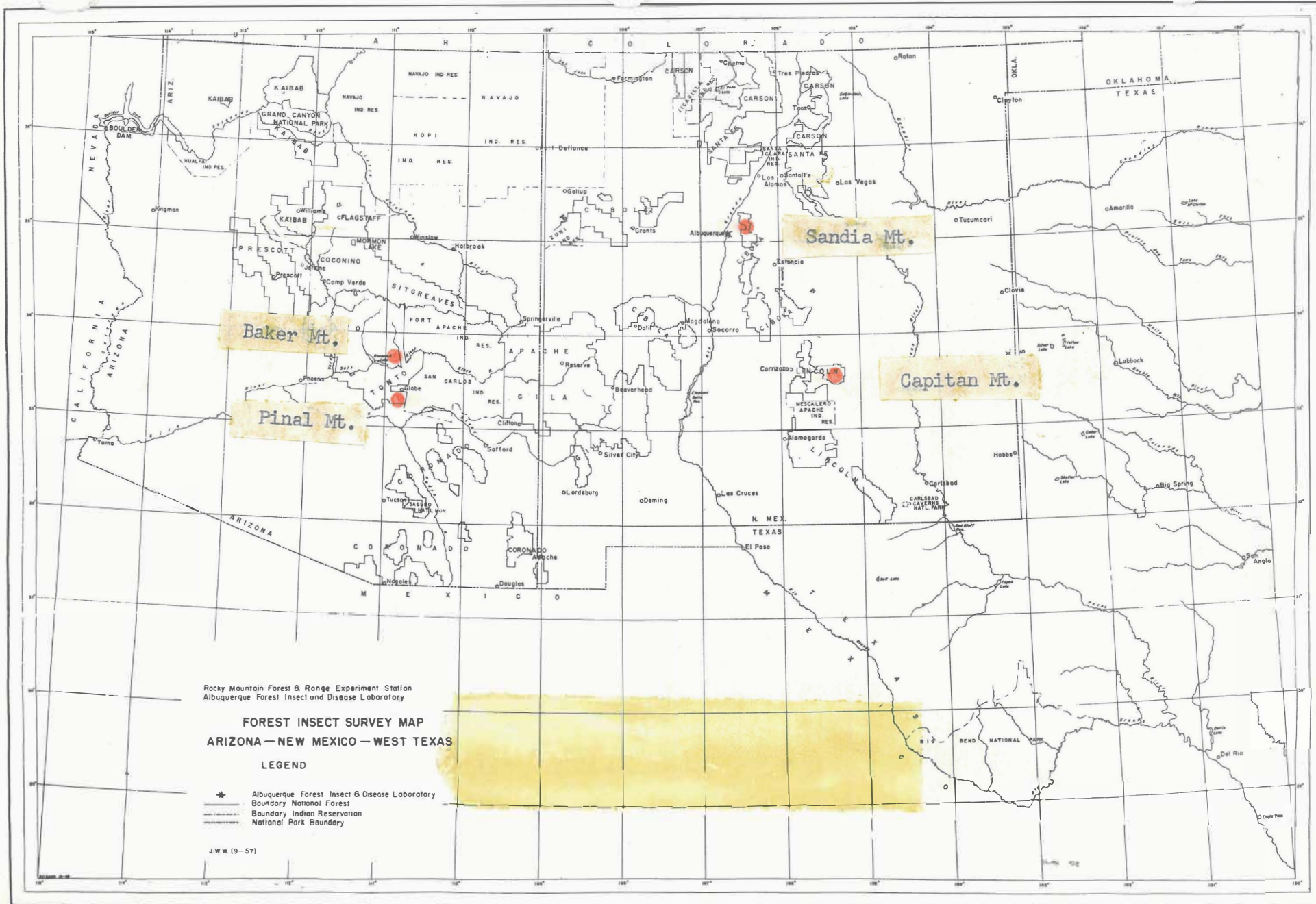
Little damage should result from the existing population. The population should subside in 1960. The area will be rechecked in 1960 to determine the trend of the existing infestation.

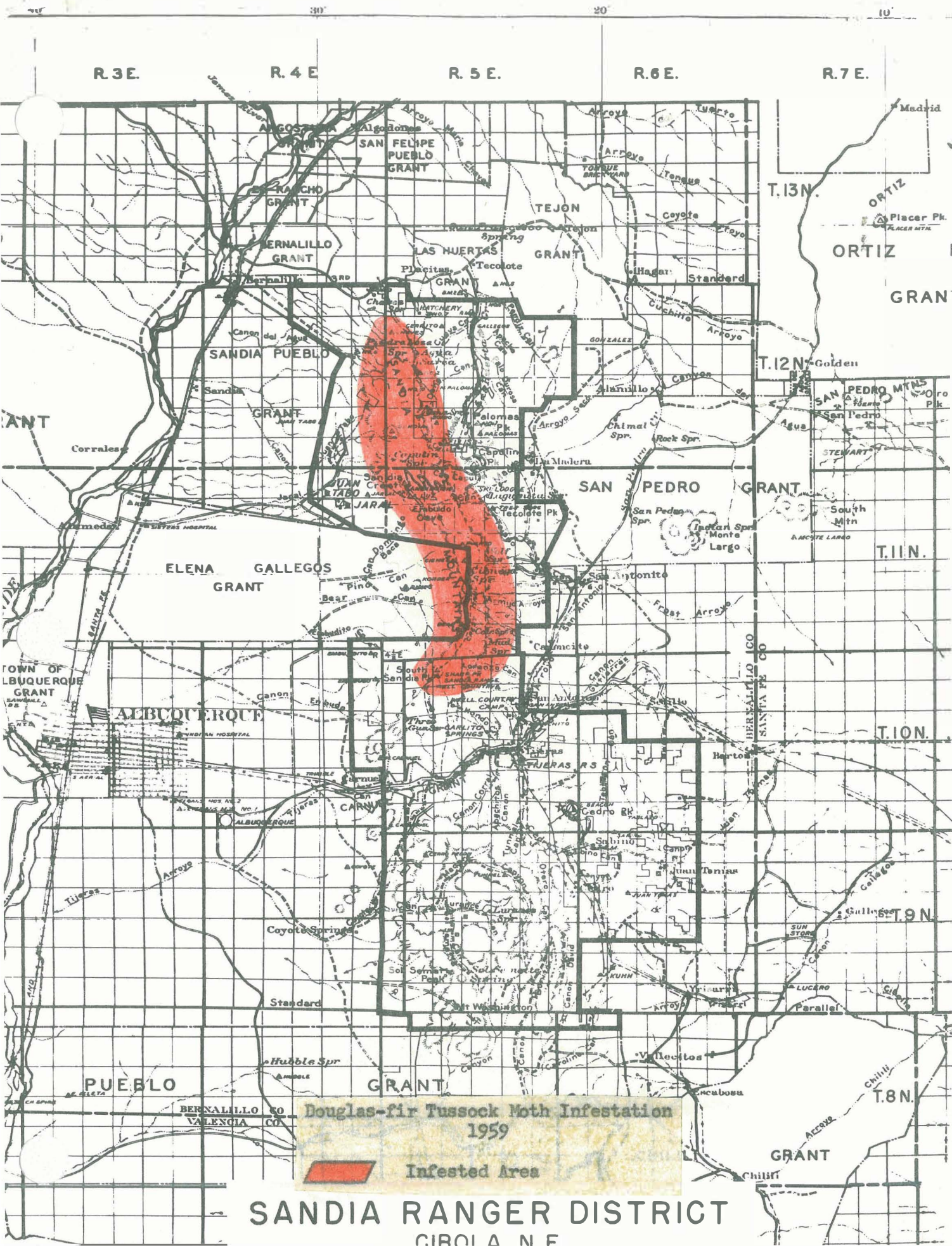
Pinal and Baker Mountains -- A ground inspection of the control area and adjacent stand failed to reveal 1959 tussock moth egg masses. Isolated pockets of defoliation may still be present. An aerial survey of the areas is scheduled for August, 1960.

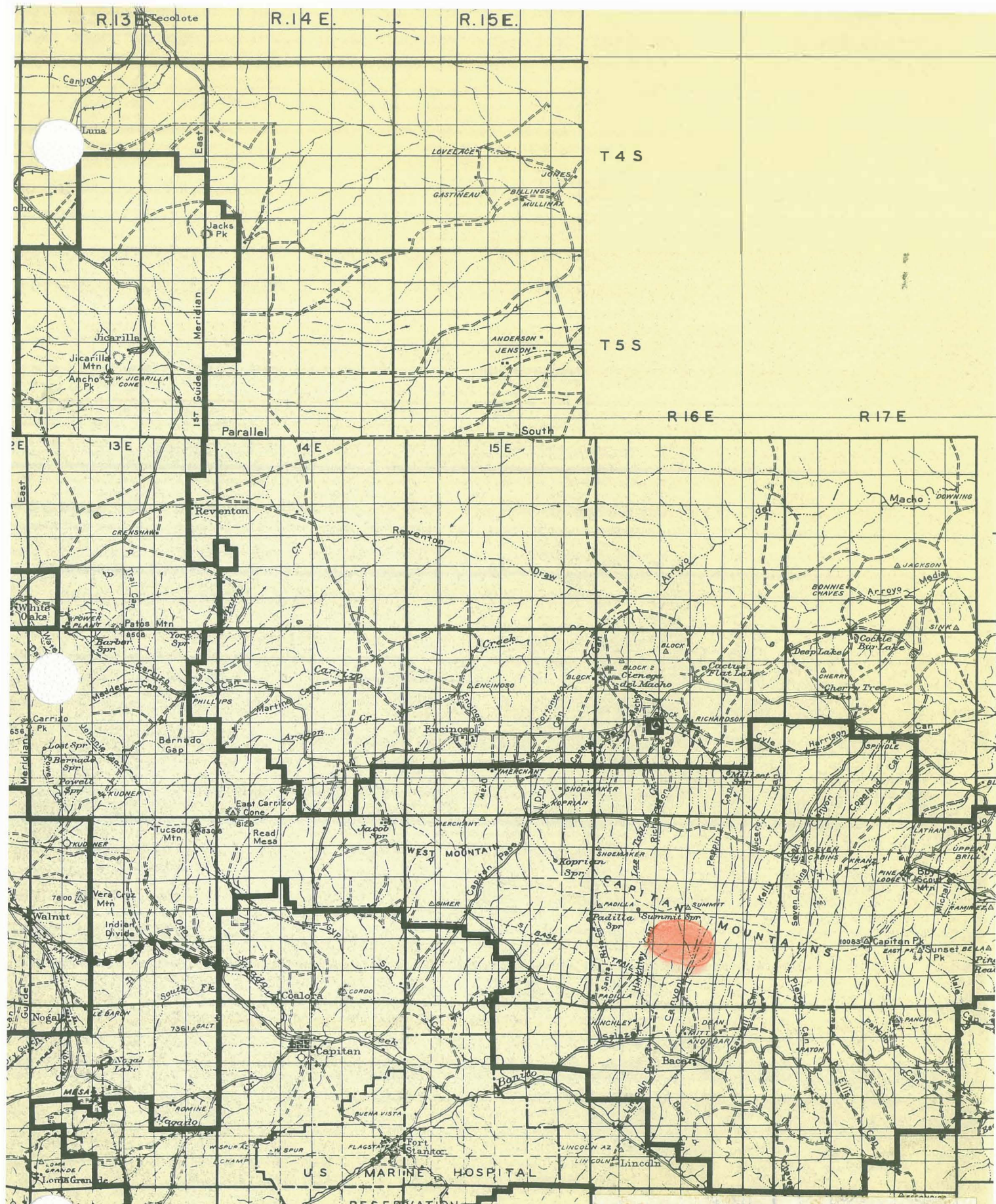
CONCLUSION

The evaluation revealed that of the four infested areas, one, the west slope of Sandia, remains a threat. The tussock moth population on the west slope is of sufficient strength to continue to deplete the mixed white and Douglas-fir stand. Unless control measures are taken the area could be a source of reinfestation. Collapse of the population by a virus infection, which has occurred in other western regions, is not expected. Incidence of virus in the moth population, to date, has been low.

Damage on Capitan, Pinal and Baker Mountains, in 1960, should be light. Final inspection of these areas is scheduled for July and August, 1960.







CAPITAN RANGER DISTRICT LINCOLN N.F.

Douglas-fir Tussock Moth Infestation
1959



Infested Area

